



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09:653,149

08/31/2000

Garo J. Derderian

M122-1330

4634

21567

7590

01/09/2002

WELLS ST JOHN ROBERTS GREGORY AND MATKIN
SUITE 1300
601 W FIRST AVENUE
SPOKANE, WA 992013828

EXAMINER

LE, THAO P

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 01/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/653,149

Applicant(s)

DERDERIAN ET AL.

Examiner

Thao P Le

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 09 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 1. 6) ☐ Other:

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement submitted on 10/09/01 was filed after the mailing date of the Application on 08/31/00. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the petition is granted and the information disclosure statement is being considered by the examiner.
2. Claims 1-25 are pending.
3. Examiner took notice of remarks made on 10/09/01.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal, U.S. Patent No. 6218256.

Regarding to claim 1, Agarwal discloses the method of forming a capacitor basically similar as claimed. See Fig. 7 and depending portions of specification. Agarwal discloses the method of forming the capacitor comprising the steps of forming a first capacitor electrode 12(Fig. 7) over the substrate, forming a dielectric layer 14, depositing a conductive barrier layer to oxygen diffusion 16, and forming a second capacitor electrode 18 (Fig. 7). However, Agarwal discloses the formation of barrier layer 16 on top of the dielectric 14 while in present invention the dielectric layer is formed on top of the barrier layer. The barrier layer 16 serve similar capability as the same the atomic layer in present invention that is to reduce the diffusion of elements between the dielectric and electrode. It would have been obvious that the order of barrier layer and dielectric layer would have been a matter of design choice. It would have been well known that transposition of process steps where the processes are substantially equivalent in terms of function, manner, and result would have been unpatentable.

Still regarding to claim 1, Agarwal doesn't expressly disclose that the barrier layer is a atomic layer but discloses the barrier layer 16 is "oxygen-annealed, electrically conductive" layer comprising oxygen annealed, refractory metal (Col. 5). It would have been inherent that the layer 16 made of oxygen annealed and refractory metal would have been considered as "atomic layer".

Regarding to claim 13, Agarwal discloses the similar method that described above and further discloses the barrier layer comprises two thin mono layers as recited in claim 13. Agarwal doesn't disclose the method for forming the mono layers is chemisorbing. It would have been obvious in the art that chemical absorption method can be used to deposit atomic onto the substrate. Other methods can be used such as CVD. It would have been a matter of design choice to choose the technique for deposition of the atomic layer.

6. Claims 2-12, 14-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal, U.S. Patent No. 6218256, and further in view of Deboer et al., U.S. Patent No. 6180481.

Referring to claims 4-9 and 22-25, Deboer et al. discloses the method of forming a capacitor above wherein the barrier layer contacts the first electrode and the barrier layer is made of TiN or alloys (Abstract) (Claims 4-5, 22). Deboer et al. also discloses that the dielectric layer 16 is made of Tantalum oxide (lines 63-65, Col. 3). Inherently, tantalum oxide exhibits a K factor of greater than 7 (Claims 6, 23). Capacitor electrode 11 comprises polysilicon (lines 30-31, Col. 3) and the dielectric layer comprises Ta_2O_5 which contains oxygen (Claims 7-8, 24-25). The dielectric layer 16 is formed over the barrier layer (Claim 9).

Referring to claims 14-17, Deboer et al. discloses the method of forming a capacitor as claimed in claim 13, wherein the first and second precursor layers each is a monolayer and comprises saturated monolayers and either the same chemical species (tantalum) (Figs. 1A-1C) or different chemical species (23, 25, Fig. 2C).

Referring to claims 19-20, Deboer et al. discloses the method above wherein the dielectric layer is formed over the barrier layer and formed after the precursor. The thickness and density of the barrier layer can reduce oxidation of the first electrode by oxygen.

Regarding to claims 2, 10-11, Agarwal discloses that the temperature used is in the range of 100-500 oC and at 1.01-20 Torr (Cols. 7-8). The method also comprising the step of forming a conductive barrier layer 16 (Fig. 7) over the dielectric layer 14.

Referring to claims 3 and 21, it would have been obvious that the thickness of the barrier layer is one of desired choice. One would have been motivated to make it not too thick to have less space but not to thin to perform its function.

Regarding to claim 18, it would have been obvious that the material used to make precursors is also one of desired choice. Moreover, it would have been well known to a person having skill in the art to use the materials comprising W, Ta, NH₃, TiCl₄ as claimed to make precursors. It is well known that those materials are widely

chosen to avoid oxidation diffusion of electrode and avoid the reaction between electrode and dielectric layer.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P Le whose telephone number is 703-605-1187. The examiner can normally be reached on M-F (8:30-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Application/Control Number: 09/653,149

Page 7

Art Unit: 2818



Thao Phuong Le
December 20, 2001

David Nelms
Supervisory Patent Examiner
Technology Center 2800